Indian Institute of Technology Madras

Web M.Tech Industrial AI

ID6003W - AI in Process and Logistic optimization

Mini Project

Submission: 11:50 pm, 30 November 2025

1 Instructions

- This mini-project will be a group project with 4-6 pre-set participants whose details can be found in the 'Student_Groups.csv', sheet 1.
- A separate report must be submitted by each group member, detailing the participant's contribution to the project.
- Along with the report, the codes, plots, etc., supporting the inferences made have to be submitted in the form of a compressed folder named after your registration number.
- Participants can use either Python or MATLAB for the following tasks.
- Project report shall be submitted before the due date. **Late submissions will not be entertained.**

2 Tasks

You are tasked to develop an automated system that analyzes loop data and predicts loop characteristics for unseen loops. Each csv file contains process variable (PV), Setpoint (SP), and Controller output (OP) data of the corresponding loop.

The provided dataset is real-world industrial loop data, so students will need to extract training targets from the descriptive information in 'Loop description.xlsx', sheet 1, corresponding to each loop in the training dataset.

You are tasked with writing code to automate the analysis of the industrial loop data shared in the CSV file. Each loop data file contains process variable (PV), setpoint (SP), and controller output (OP) data. The automation should be designed in a way that, when loaded with any loop data, the analysis for the following tasks is automatically performed, and the corresponding inferences are displayed.

1. Loop Behavior Analysis: Automatically detect and categorize key loop behaviors - oscillations, noise, disturbances, variance, and estimate the probability of stiction.
2. Automated Inference Generation: Generate and display at least two automatic inferences based on the analyzed loop conditions.
3. Comprehensive Summary: Present the detected conditions and corresponding inferences in a structured output or summary table.

3 Evaluation Criteria

A hidden test dataset will be shared 24 hours before the final project deadline. You will have 24 hours to run your trained model on the test dataset, generate the analysis and inferences, and submit your final results and report. Final scores will be awarded based on the performance of your model on the test dataset, as well as the quality of your analysis and presentation.